

VEHICLE REPAIR CLAMPS

The present invention relates to clamps used for connecting straightening devices to vehicle frames or uni-bodies. Specifically, the embodiments of the present invention relate to vehicle clamps comprising non-linear and/or hinged clamping portions.

BACKGROUND OF THE INVENTION

When a vehicle has been in an accident, it is common for the frame, in the case of vehicles having a frame, or the unibody to be bent or deformed. It is well known that it is necessary to straighten the portions of the frame or unibody in order to affect an acceptable repair. As used herein in connection with repairing a damaged vehicle, the term "straighten" refers to returning one or more portions of a vehicle closer to its original configuration than the configuration it was in prior to starting the repair. The term "straighten" when used in this context does not necessarily indicate that the portion of the vehicle being repaired is made to be linear.

It is common in the vehicle repair industry to attach a powerful hydraulic straightening device to one or more portions of a vehicle utilizing a clamp which is attached directly to the vehicle and to a chain which connects the clamp to the straightening device. To the best knowledge of the inventor, the jaws of previously known clamps of the prior art have been straight and have also been formed with unitary jaws, i.e., two relatively

movable "jaw" pieces which each comprise gripping surface formed of a unitary element. As used herein, the term "jaw" is used to indicate one side of the portion of the clamp which is used to grasp a portion of the vehicle. Thus, it will be understood that a clamp requires at least two jaws which are tightened onto the portion of the vehicle to which force will be exerted by the pulling device. Many portions of a vehicle, to which it would be desirable to apply a force during vehicle repair, are not linear, but rather are formed by the intersection of two portions meeting at an angle or are curved. It would, therefore, be desirable to provide one or more clamps shaped to grasp angled and/or curved portions of a damaged vehicle.

SUMMARY OF THE INVENTION

The present invention is directed to vehicle repair clamps for grasping curved or non-linear surfaces. One embodiment of the present invention comprises a hinged clamp comprising at least one jaw formed of a plurality of jaw sections that are hingedly connected and that may be adjusted to grasp surfaces of different angles. The clamp segments may be straight or arcuate. These embodiments facilitate attachment of the hinged jaws to portions of a damaged vehicle which form different angles and/or have various radii of curvature.

Another aspect of the present invention is directed to vehicle repair clamps comprising jaws with non-linear clamping portions.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top, exploded view of a hinged clamp having arcuate jaw segments according to one embodiment of the present invention.

Figure 2 is a bottom exploded view of the clamp shown in Figure 1.

Figure 3 is a top perspective view of the clamp shown in Figure 1.

Figure 4 is a bottom perspective view of the clamp shown in Figure 1.

Figure 5 is a side perspective view of the clamp shown in Figure 1.

Figure 6 is a side perspective view of an alternative embodiment of the present invention.

Figure 7 is a perspective side view of the embodiment shown in Figure 6 with a ring connector and loop tighteners.

Figure 8 is a top, perspective view of an alternative embodiment of the present invention comprising arcuate jaws.

Figure 9 is a bottom, perspective view of the embodiment shown in Figure 8.

Figure 10 is a diagram illustrating positions on a vehicle where various embodiments of the present invention may be particularly useful.

DETAILED DESCRIPTION

As noted above, various embodiments of the present invention are designed to facilitate attachment of a straightening device to a portion of a car which is formed on an angle or curve. Embodiments of the present invention are suitable for providing secure

attachment to interior angles which are less than 180° or exterior angles which are greater than 180°, as well as to the inside or outside of a curved vehicle portion.

According to one embodiment of the present invention shown in Fig. 1, each jaw of a clamp comprises a pair of arcuate jaw segments 10 which are hingedly connected by throughbolt 50 and loop tightener 120. While in this illustrated embodiment, each jaw comprises two jaw segments 10, it is also within the scope of the present invention to utilize a greater number of jaw segments to form a single jaw. It is also within the scope of the present invention to utilize at least one non-linear shaped jaw segment 10 and at least one linear jaw segment in a single jaw.

The illustrated jaw segments advantageously each comprise at least one clamp pad 70 which is selectively secured to each jaw segment 10 by removable fasteners 80. In the illustrated embodiment, fasteners 80 are threaded screws which facilitate the placement of clamp pad 70 when desired. Fasteners 80 are advantageously countersunk into clamp pad 70 so that they will not contact the vehicle portion to which the clamp is attached. Illustrated clamp pads 70 have a knurled surface in order to enhance gripping of the vehicle portion to which attachment is desired. Clamp pads 70 can be formed of any suitable material. It is generally preferred that the material be harder than the material to which it will be attached.

In addition to being hingedly connected by the bolt 50 and loop tightener 120, opposing jaws of this illustrated embodiment are drawn together after positioning on the desired vehicle portion by bolts 105 and nuts 110. From the present description and drawings, those skilled in the art will appreciate that the portion of clamp pad 70 extending from the edge of the clamp pad to bolts 105 is available for gripping a portion of a vehicle.

Typically, this distance is preferably about 3/8 inch to about 1 inch, however, greater or lesser gripping areas may be used. Alternatively, other types of gripping surfaces can be provided either on clamp pads or directly on surfaces 30 of the jaw segments 10.

Loop tightener 120 can be hand tightened onto bolt 105. As shown, a ring connector 100 can also be attached to bolt 50 in order to provide a different point or points of attachment for exerting force with a straightening device. According to this preferred embodiment of the present invention, ring connector 100 is attached to bolt 50 and positioned on the desired side of the clamp before the jaws have been secured to a vehicle portion. Different types of connectors, other than the ring connector 100 and loop tightener 120 can be employed to facilitate the connection of a straightening device to the clamp. As illustrated, each jaw element advantageously comprises a step 20 proximate the hinge connection.

Figure 2 is an exploded perspective view of the clamp shown in Figure 1. This view illustrates another advantage of this embodiment wherein each clamp segment 10 is identically shaped. From this description, those skilled in the art will appreciate that forming the clamp segments in identical shapes facilitates replacement and ease of manufacturing. Figures 3-5 illustrate the clamps shown in Figures 1 and 2 in assembled configurations.

Figures 6 and 7 illustrate an alternative embodiment of the present invention wherein jaw segments 210 are relatively straight, as opposed to the non-linear shape of jaw elements 10 shown in Figures 1-5. In other respects, the clamps shown in Figures 6 and 7 are similar to the clamps shown in Figures 1-5, in that a pair of jaw segments 210 are hingedly connected. In the embodiment of Figures 6 and 7, the hinge is formed by a

bolt 250 secured with a nut 310 and loop tighteners 320 are used to tighten bolts 305. This embodiment also comprises a ring connector 300 and clamp pads 270 secured to jaw segments 210 by removable fasteners.

An alternative embodiment of the present invention is illustrated in Figure 8 wherein a clamp has two unitary jaws 310. Each jaw 310 has an arcuate shape. While the illustrated jaws 310 pass through an arc of about 70°, the jaws of this embodiment of the present invention can pass through a greater or lesser arc and can have greater or lesser radii of curvature. Jaws of the type shown in Figure 8 or other jaws of the present invention can be formed with most, if not all, curves or other non-linear shapes typically encountered in vehicle repair. As noted above, connector ring 400 can be disposed on the outside of the curvature as illustrated in Figure 8 or can be positioned on the opposite side, i.e., inside, of the curvature if desired. Figure 9 is a bottom perspective view of the clamp showed in Figure 8. Other elements shown in Figures 8 and 9 are similar to elements discussed above including clamp pads 370, ring connector 400, loop tighteners 420, throughbolt 405 and tightening nut 410.

Figure 10 is a diagram illustrating positions 500 on a vehicle where various embodiments of the present invention may be particularly useful.

While the illustrated, non-linear jaws and jaw segments shown in the drawings are generally arcuate, it is also within the scope of the present invention to have other non-linear jaw configurations.

Thus the various embodiments of the present invention provide clamps for vehicle repair which are designed to more closely follow the contour of a non-linear portion of the vehicle being repaired. The arcuate shape of jaw and/or jaw segments can provide

a greater gripping surface for angled and/or curved portions of a vehicle. Additionally, the hinge connection between jaw segments provides a technician with the ability to change the relative positions of the jaw segments to either increase or decrease the angle in which they are connected in order to maximize the effective clamping surface area of the clamp on the vehicle.